Section 4 – Traffic Flow Management (TFM) System Overview

4.1 Traffic Flow Management (TFM)

Air Traffic Management (ATM) encompasses Traffic Flow Management (TFM) and Air Traffic Control (ATC) capabilities and is designed to minimize air traffic delays and congestion while maximizing overall National Airspace System (NAS) throughput, flexibility, and predictability. ATM seeks to *predict* air traffic demand and constraints more accurately so that predicted air traffic congestion can be dealt with safely, efficiently, and economically using a variety of proven strategies such as large scale rerouting, ground delays, and metering. With the introduction of new technologies, applications, and procedures, the number of available ATM strategies expands over time and the NAS becomes more *flexible* in its ability to accommodate changing conditions and increasing levels of air traffic without adversely affecting the *throughput* of the system.

TFM, a major component of ATM, is the strategic planning and management of air traffic demand intended to ensure smooth and efficient traffic flow through FAA-controlled airspace. TFM seeks to give equitable access for all NAS users while accommodating user preferences for flight times, routes, and altitudes to the extent feasible. The mission of the traffic management system is to balance air traffic demand with system capacity to ensure the maximum efficient utilization of the NAS. A safe, orderly, and expeditious flow of traffic, with minimal delays, is fostered through continued analysis, coordination, and dynamic utilization of traffic management initiatives and programs.

FAA traffic managers perform air traffic management across the US, as well as in and out of the US through the surrounding nations and oceans. These traffic managers are located in special Traffic Management Units (TMUs) located in the following FAA air traffic control facilities:

- Air Traffic Control System Command Center (ATCSCC) facility
- 21 Air Route Traffic Control Center (ARTCC) facilities
- 35 Terminal Radar Approach Control (TRACON) facilities
- 8 Air Traffic Control Tower (ATCT) facilities
- 3 Combined Center Radar Approach Control (CERAP) facilities.

Air traffic management is performed through a hierarchical organization of Traffic Management Coordinators (TMCs). At the top of the hierarchy is the ATCSCC, which is concerned with the management of nationwide traffic problems and the coordination and approval of actions taken by the distributed traffic management facilities. The next level of traffic management consists of TMUs at the twenty-one ARTCCs. Each ARTCC TMU is responsible for the management of traffic problems that are within the scope of the ARTCC. The final level of the hierarchy consists of TMUs at the TRACON facilities, the CERAP facilities, and

ATCTs. The TRACON and CERAP TMUs manage problems specific to the terminals under their control.

4.2 TFM Infrastructure Overview

The TFM Infrastructure is the set of hardware, software, and communication networks that provide TFM service providers and users with specialized tools and up-to-date status of air traffic across the country. The Enhanced Traffic Management System (ETMS) is the core of the TFM Infrastructure. ETMS is a mission-essential system used to track, predict, and plan air traffic flow, analyze ground delay effects, and evaluate alternative routing strategies.

Exhibit 4-1. TFM Functional Architecture Diagram provides a functional view of the TFM infrastructure, showing the facilities involved in providing and using TFM, the major automation tools used at these facilities, and the external interfaces to ETMS. ETMS external interfaces are the interfaces with non-ETMS applications and equipment for which Interface Control Documents (ICDs) or agreements exist. ETMS external interfaces, depicted as shaded boxes in this diagram, are described in Section 4.6.1, TFM External Interfaces. Facilities shown in this diagram are described in Section 4.3, TFM Facilities. Tools shown in this diagram and mentioned in other parts of the document are described in Section 6, TFM Tools and Products. See Section 8, Acronyms and Abbreviations, for acronyms used in this figure.

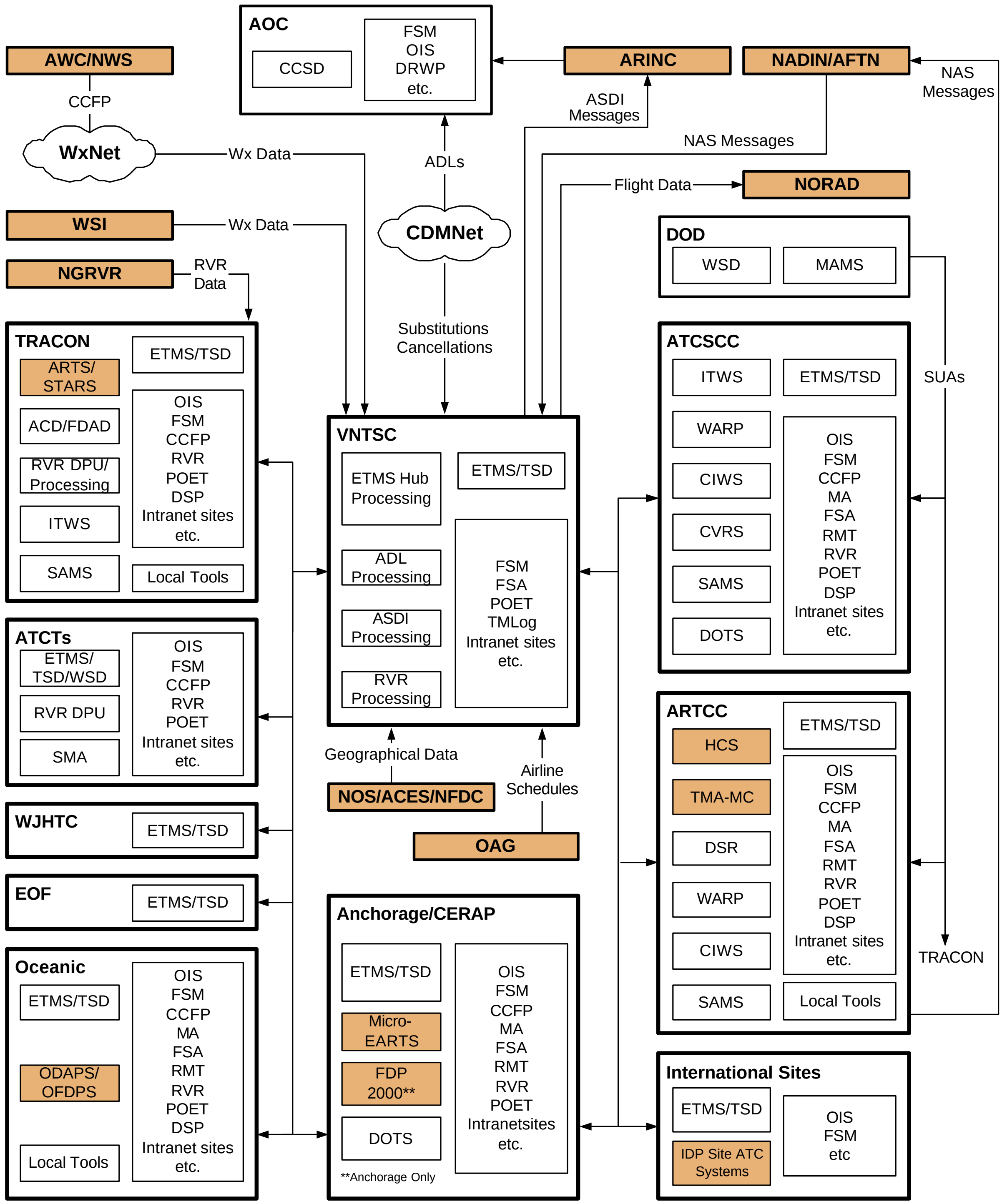


Exhibit 4-1. TFM Functional Architecture Diagram

4.3 TFM Facilities

Traffic managers, located in TMUs at the FAA ATC facilities described in this section, perform air traffic management tasks across the NAS. Two other facilities, Volpe National Transportation Systems Center (VNTSC) and William J Hughes Technical Center (WJHTC), that provide support of those services are also described in this section.

4.3.1 Volpe National Transportation Systems Center (VNTSC)

The Volpe National Transportation Systems Center (VNTSC) is the heart of the TFM Infrastructure. Located at Cambridge, MA, VNTSC provides the centralized, real-time, continuous data collection and processing functions to support the entire TFM infrastructure. This TFM infrastructure 'Hub' processes real-time incoming data, maintains a large distributed database, performs traffic modeling, and transmits processed data to the traffic managers at the remote field sites at the ARTCCs, CERAPs, selected TRACONs, selected ATCTs, and some international sites where the traffic management is performed. 'Volpe' is also the development and maintenance organization of many TFM tools as described in Section 6, TFM Tools and Products.

4.3.1.1 VNTSC Configuration

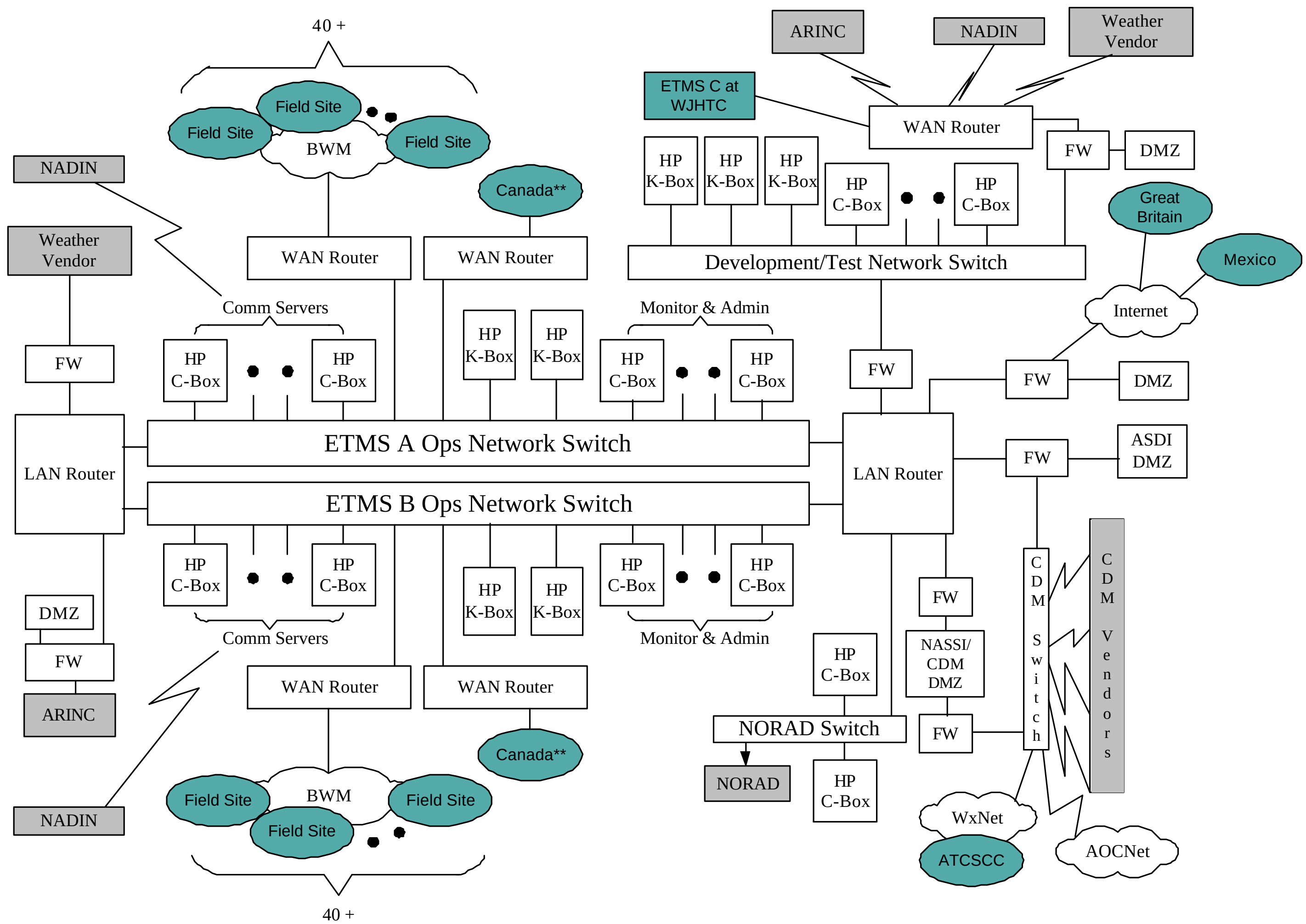
The Volpe 'Hub' is comprised of multiple 'strings' of processors, network equipment, and software for operational processing as well as for software development and test. Each string has all of the equipment and applications necessary to execute a specific portion of the system.

There are two operational ETMS strings. Each operational ETMS string is identical to the other and is fully capable of executing all ETMS functions. Two operational ETMS strings are implemented to satisfy ETMS availability requirements. Operational strings consist of routers, firewalls (FWs), De-militarized Zones (DMZs), and Hewlett Packard (HP) K and C processors running ETMS and Flight Schedule Monitor (FSM) software as well as other TFM tools. The operational strings have the necessary communications equipment to connect to various external interfaces such as ARINC, NADIN, WxNet, Bandwidth Manager (BWM), etc. Operational ETMS Strings 'A' and 'B' at the Hub are duplicates of each other to provide hot standby in case one becomes unavailable. During normal operation, one string services half of the remote field sites and the other string services the other half of the field sites.

In addition to the operational strings, there are development and test strings that are isolated from the operational ETMS strings by firewalls and routers. The development and test strings consist of ETMS and Collaborative Decision Making (CDM) strings. The ETMS strings support ETMS Hubsite software development and test, and the CDM strings support the development and prototype testing of the collaborative decision making (CDM) functions. During prototype testing, the airlines can access the CDM test strings to test out the CDM functions. The development and test strings are connected to the same external interfaces as the ETMS operational strings. The WJHTC ETMS C string is connected to Volpe's development and test string. This connection allows the WJHTC testers to utilize ARINC data which is otherwise unavailable at the WJHTC.

The Volpe Hub also has a "NORAD" string. This string is the only string that interfaces with NORAD. The NORAD string runs a modified version of the ETMS flight data processing application and provides a modified ETMS data feed to NORAD. The NORAD string does not run all of the ETMS processes (e.g., processes associated with traffic demand, ground delay programs, and flight constrained area processing) and it does not use weather data. The NORAD string is isolated from all other Volpe strings by firewalls and routers and is not supported by Volpe ETMS Operations staff.

Exhibit 4-2. ETMS Network Configuration at Volpe depicts the ETMS network at Volpe. System security and disaster recovery of the Volpe facility are described in Section 7. ETMS external interfaces are described in Section 4.6. CDM is described in Appendix A.



**Just like all other ETMS field sites, Canada has redundant connections to ETMS - one on ETMS A and the other on ETMS B. At any given time, only one of these connections is active. The inactive connection is present for backup purposes only. Positions of physical switches on the associated routers dictate which connection is active. Canada is directly connected to ETMS, which is unlike the other remote sites which are connected through the Bandwidth Manager.

Exhibit 4-2. ETMS Network Configuration at Volpe

4.3.2 Air Traffic Central System Command Center (ATCSCC)

The ATCSCC, located at Herndon, VA, performs traffic flow management based on system-wide concerns that focus on the strategic NAS situation and its longer planning horizon. It is the centralized manager for TFM capabilities with collateral TFM functionality and responsibilities distributed to TMUs at ARTCCs, TRACONS, CERAPs, and ATCTs.

Traffic Management Specialists (TMSs) at the ATCSCC compare forecast and actual traffic demand and weather data with the NAS equipment availability and ATC system capacity. ATCSCC specialists then formulate a national flow management plan in coordination with, and implemented through, the facility TMUs and Airline Operations Centers (AOCs). The ATCSCC ensures that traffic demand on any NAS resource does not exceed its safe operating capacity and seeks to distribute any necessary delays equitably.

The ATCSCC monitors all of the domestic NAS, traffic flowing into and out of NAS from directly adjacent countries (Canada and Mexico), and monitors and coordinates with Oakland, Anchorage, and New York Centers on oceanic flow issues if required.

Traffic management initiatives most often issued at the national level include Ground Delay Programs (GDP), Ground Stops (GS), Severe Weather Avoidance Plan (SWAP) reroutes and Miles-in-Trail (MIT) restrictions.

4.3.2.1 ATCSCC Configuration

The ATCSCC is configured with three operational strings, two strings for ETMS, FSM, and other TFM tools and one string to support CDM operations. Also included in this protected environment is a string of processors for testing and training. A separate string of processors supports the ATCSCC Intranet website applications, such as the Operational Information System (OIS) and the Route Management Tool (RMT), while another string supports Internet website applications, such as the e-Special Traffic Management Program (e-STMP). A separate development string also has access to the Internet. The ATCSCC's interfaces to the outside environment are protected by firewalls and intrusion detection systems.

Exhibit 4-3. ETMS Network at ATCSCC depicts the network at ATCSCC. System security and disaster recovery of the ATCSCC facility are described in Section 7. ETMS external interfaces are described in Section 4.6. Tools including OIS, RMT, and e-STMP are described in Section 6.

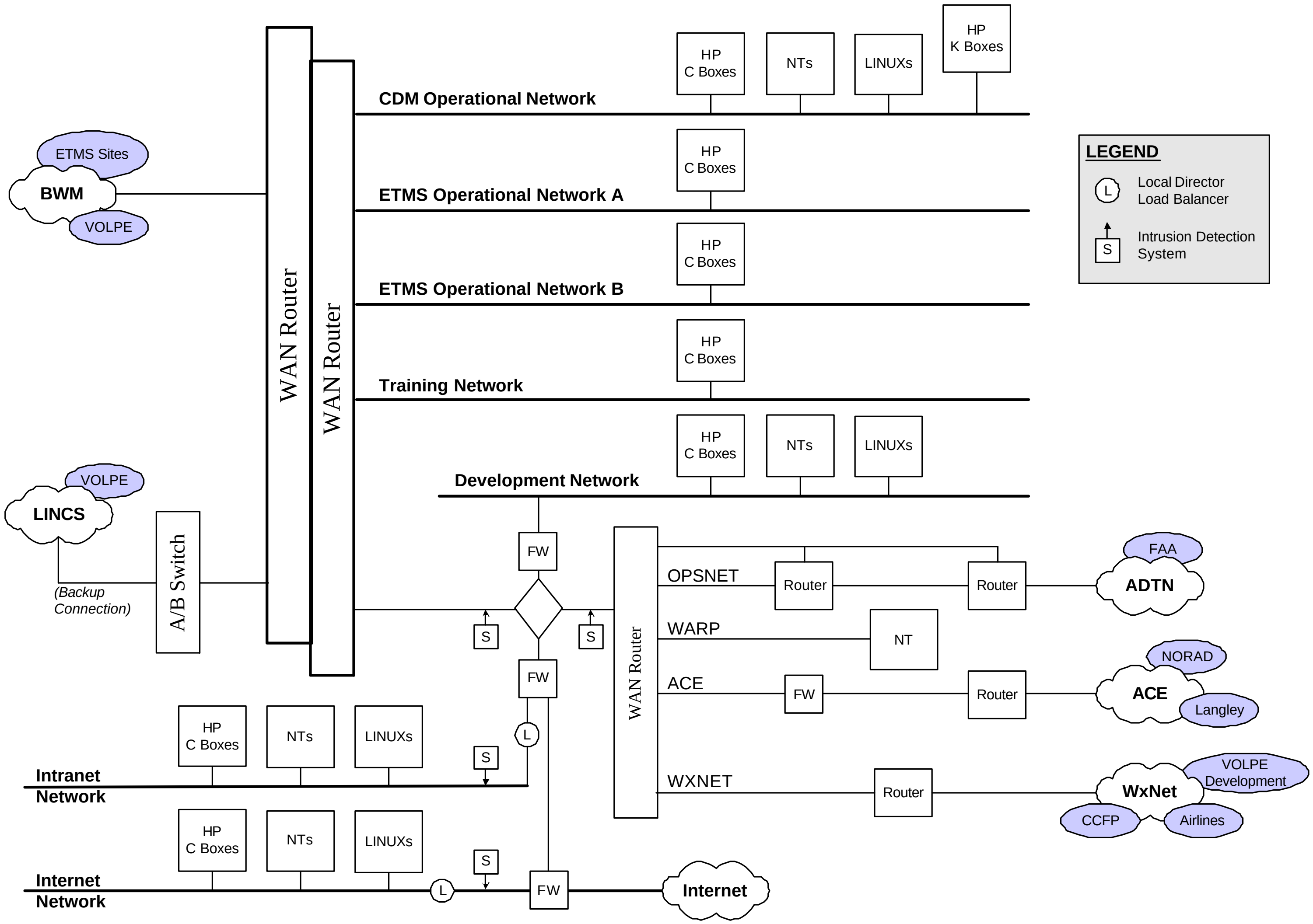


Exhibit 4-3. ETMS Network at ATCSCC

4.3.3 Air Route Traffic Control Centers (ARTCCs)

TFM is implemented at all 21 ARTCCs. Each ARTCC is configured with a single ETMS string, connected to Volpe via the ETMS secure WAN, and two routers. Redundancy is provided at ARTCCs through two A/B switches. One A/B switch is used to simultaneously switch communications between the two ETMS file servers (primary and backup) and the ARTCC's Host Computer System (HCS). The second A/B switch is used to switch communications connectivity between the two routers.

ARTCC TMU activities are conducted in accordance with the Facility Operation and Administration (7210.3S) Manual, Section 17-2. Whereas ATCSCC traffic managers deal with the strategic flow of air traffic, ARTCC traffic managers focus on the tactical flow of air traffic within their Area of Responsibility (AOR). ARTCC traffic managers are concerned with maintaining acceptable airport arrival and departure rates (AAR and ADR, respectively), enroute spacing, and overall traffic management planning activities within their Centers. They impose restrictions, reroutes, and other situation appropriate initiatives in conjunction with, or as directed by, the ATCSCC. ARTCC traffic managers prefer to use MIT restrictions to moderate the local traffic flow, but may use other types of traffic initiatives (e.g., Approval Request (APREQ)). Traffic management decisions are communicated to ATC controllers who implement them.

ARTCC traffic managers coordinate their efforts with traffic managers in adjacent ARTCCs and in the TRACONs and towers that underlie the Center. They also coordinate with the ATCSCC by participating in regular teleconferences (TELCONs) and by reporting airport arrival and departure delays, as well as equipment (e.g., NAVAID/radar shutdowns, TELCO outages, computer malfunctions or outages) and runway configuration changes. Such delays and equipment/runway changes have potential impact on national air traffic flow and may result in ATCSCC action.

ARTCCs tasked with oceanic responsibilities (Oakland, Anchorage and New York Centers) also generate and acquire data (tracks and advisories) concerning oceanic traffic flows.

4.3.3.1 Typical Field Site Configuration

Exhibit 4-4. Typical Site ETMS Network Configuration depicts a typical configuration of an ETMS field site. ETMS remote sites have one of three configurations: pure HP remote site (HP fileservers and HP workstations); mixed platform remote site (HP fileservers and HP and Linux workstations); and pure Linux remote site (Linux fileservers and Linux workstations). Mexico is the only site with a Linux server. The ETMS configuration at an ARTCC, TRACON, ATCT, or other FAA facility vary from one another in the number of processors that reside in the installation and the systems with which it interfaces (Host, ARTS, etc.). However, all operational sites have both a primary fileserver and a backup fileserver. Some non-operational sites (FAA regional offices) have only a single fileserver.

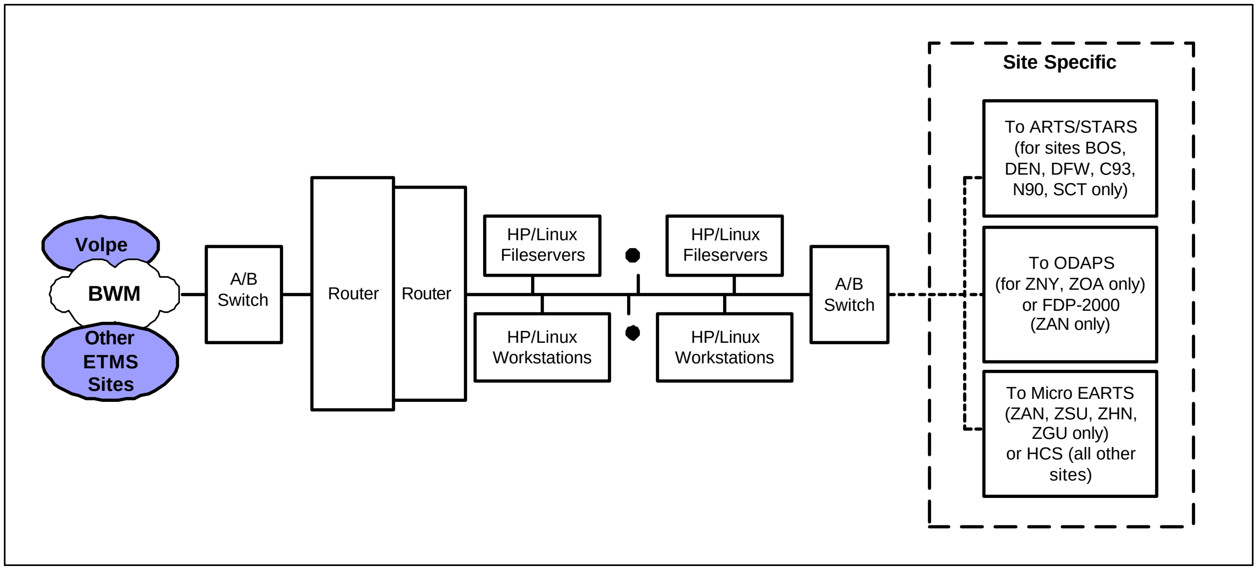


Exhibit 4-4. Typical Site ETMS Network Configuration

4.3.4 Terminal Radar Approach Controls (TRACONs)

TMUs in high-activity TRACONs use a variety of techniques such as vectoring, speed control, MIT restrictions, and airborne holding to manage departure flows to adjacent facilities and the sequencing and spacing of aircraft on final approach to the towers. Currently these 35 high-activity TRACON facilities are equipped with ETMS/Traffic Situation Displays (TSDs):

- Houston (IAH)
- Las Vegas (LAS)
- Memphis (MEM)
- Miami (MIA)
- Minneapolis (M98)
- Nashville (BNA)
- New York (N90)
- Oakland (C90)
- Orlando (MCO)
- Philadelphia (PHL)
- Phoenix (P50)
- Pittsburgh (PIT)
- Atlanta (A80)
- Portland (PDX)
- Denver (DIA)
- Southern CA (SCT)
- Dallas Fort-Worth (D10)
- Boston (A90)
- Louisville (SDF)
- Tampa (TPA)
- Indianapolis (IND)
- Cleveland (CLE)
- Seattle (S46)
- Washington National (DCA)
- Chicago (C90)
- Raleigh Durham (RDU)
- Baltimore (BWI)
- Detroit (D21)
- Northern CA (NCT)
- Charlottesville (CLT)
- Cincinnati (CVG)
- Salt Lake City (SLC)
- Anchorage (ANC)
- St Louis (T75)
- Dulles (IAD)

4.3.5 Air Traffic Control Towers (ATCTs)

Tower controllers observe traffic positions, formulate taxi sequences, handle requests for departures, and ensure efficient flow of traffic at the airports. TM responsibilities in towers, where there may not be a specific TM position staffed, are delegated to the Operational Supervisor in Charge (OSIC), who coordinates local flow initiatives with control staff, provides local status information and implements flow directives in conjunction with associated TRACON or Center TMUs.

TFM functionality is implemented at these eight highest-activity ATCT facilities.

- San Francisco (SFO)
- LaGuardia (LGA)
- Newark (EWR)
- Kennedy (JFK)
- Dallas (DFW)
- Atlanta (ATL)
- Los Angeles (LAX)
- Chicago (ORD).

The 8 ATCTs listed above have full access to ETMS. Additionally, more than 350 towers have access to ETMS capabilities via the Web-Based Situation Display (WSD), a TSD-like display available via the web, to obtain situational awareness of TFM activities.

4.3.6 Combined Center Radar Approach Control (CERAP)

TMUs are also located at three non-continental US (CONUS) CERAP facilities: Honolulu (ZHN), San Juan (ZSU), and Guam (PZUA). All three are connected via the Bandwidth Manager (BWM) just like all other field sites. Honolulu and San Juan are civilian sites whereas Guam is a U.S. military site.

4.3.7 William J Hughes Technical Center (WJHTC)

The Operational Test and Evaluation (OT&E) function for ETMS is performed at the William J Hughes Technical Center (WJHTC). ETMS software is divided into two categories, the Hubsite software, which runs at Volpe, and the remote field site software, which are applications that run at the field sites. To test the ETMS Hubsite software, the WJHTC has duplicate Hubsite strings that mimic Volpe’s A and B strings. To test the ETMS remote field site software, WJHTC has three configurations: pure HP remote site (HP fileservers and HP workstations); mixed platform remote site (HP fileservers and HP and Linux workstations); and pure Linux remote site (Linux fileservers and Linux workstations). The WJHTC also has NT PCs that can be used to test FSM and display TSDs.

OT&E tests at the WJHTC use live and simulated data including interfaces to weather, NADIN / ARINC, and Host. Because the WJHTC network does not have connections to either ARINC or the weather providers, it gets data from these sources indirectly by linking to the Volpe development and test string (refer to Exhibit 4-2, ETMS Network Configuration at Volpe). Currently, the WJHTC does not have an interface to the airlines and simulated airline data is unavailable.

Because the WJHTC serves as a backup facility for the Volpe Hubsite, it is configured with duplicate strings that mimic Volpe's A/B strings. These strings are referred to as the U/V strings. The U/V strings are isolated from the WJHTC test environment. The WJHTC has connectivity to all the field sites via the Bandwidth Manager.

See Section 7.5.1 for a discussion of the ETMS Build Cycle, Section 7.2.1 for a discussion of Disaster Recovery for Volpe, and Section 6.1.9.2 for a discussion of ETMS Hubsite and field site software.

4.3.8 Emergency Operating Facility (EOF)

The Emergency Operating Facility (EOF) is a separately located TFM configuration established to perform backup in the event the ATCSCC is rendered inoperable or is in a highly degraded state. The EOF is configured with major ATCSCC operational positions. The EOF is currently located at Washington ARTCC (ZDC). See Section 7 for a discussion of ATCSCC Disaster Recovery.

4.3.9 International Sites (Canada, Great Britain, and Mexico)

International sites in Canada, Great Britain, and Mexico are just like other 'field sites' with regard to ETMS. TMUs located at these international sites are involved in the planning and implementation of traffic management initiatives. The international sites provide flight plans, departure information, and track updates to ETMS. International sites can see all flights except military flights on the TSD. The Canadian site (Ottawa) is connected to Volpe via dedicated lines, not the Bandwidth Manager (BWM) like the US field sites. All other Canadian sites are connected to Ottawa. The British and Mexican sites access ETMS via Virtual Private Network (VPN) connections. The London site has a feed to its Scottish facility.

The Canadian system provides the full NAS message set to ETMS from its 7 operational centers: Gander, Moncton, Montreal, Toronto, Winnipeg, Edmonton, and Vancouver. There is much traffic management coordination with the Canadian TMUs. The Severe Weather Management Specialist at the ATCSCC often works with the Canadian TMU specialists to discuss and plan reroutes.

See Section 4.6.1.6 for a discussion of the interface between ETMS and International ATC Systems.

4.4 TFM Service Providers

Traffic management staff at the ATCSCC, all ARTCCs, major TRACONs, and major ATCTs provides traffic management services. The activities the TFM service providers perform are described in Section 5, Traffic Management Activities. Tools used in the performance of traffic flow management are listed in the following subsections and are described in Section 6, TFM Tools and Products.

4.4.1 ATCSCC Traffic Management Positions

Service providers at the ATCSCC develop a NAS-wide understanding of conditions, capacity, and traffic flow to serve as a central point-of-contact for NAS users and local service providers at the field sites. The ATCSCC Traffic Management staff use various tools to manage information about current and predicted NAS conditions as well as past performance. Operational positions at the ATCSCC include the following:

- National Operations Manager (NOM)
- NTMO / Area Manager
- East and West Area Specialists
- Severe Weather Management Specialist
- Weather Unit Specialist
- Strategic Planning Team (SPT)
- Tactical Consumer Advocate (TCA)
- NOTAM Specialist
- Computer Systems Analyst (CSA)
- Central Altitude Reservation Function (CARF) Specialist.

4.4.1.1 National Operations Manager (NOM)

The NOM is responsible for planning and directing the national traffic management program and all control room operations. ATCSCC staff keep the NOM informed of all situations affecting the national air traffic flow including significant equipment outages, various weather phenomena, special interest flights, and newsworthy incidents using both verbal and electronic means (e.g., via OIS updates, position logs).

The NOM directs the coordination and collaboration with AT facilities and users to discuss system operations, and directs teleconferences (TELCONs) with them pertaining to strategic planning, diversion recovery, NAS status, weather, route availability, and / or other significant events, when necessary. The NOM prepares for and conducts separate daily briefings with FAA Headquarters (i.e., ATT-1 Air Traffic Tactical Operations) and users that focus on the overall operation for the previous day and follow-up on issues. The NOM also conducts daily outlook briefings for the ATCSCC staff.

The NOM is the coordination point concerning special events, VIP movements, and military mission activities. During periods of severe weather, the NOM works with military representatives to arrange for the use of inactive military airspace for rerouting around bad weather. All national security matter events are handled by the NOM via the Security Hotline, which is open 24 hours a day.

The primary tool used by the NOM is the phone. Other tools used include:

- OIS for staff assignments and to update restrictions and capacities

- WARP, Collaborative Convective Forecast Product (CCFP), and Integrated Terminal Weather System (ITWS) for weather information
- TSD for overall situation awareness
- Departure Spacing Program (DSP) during severe weather to see how flights are lined up and which flights have no routes
- ETMS Log and TMLog for information on previous day events.

4.4.1.2 National Traffic Management Officer (NTMO)/Area Supervisor

Each of the positions listed in Section 4.4.1 ATCSCC Traffic Management Positions, except for the NOM and the NTMO, defines an operations area within the ATCSCC. Each of these areas has its own NTMO/Area Supervisor that supervises the specialists within the area. The NTMO stays abreast of the key events and initiatives within the assigned area, often assisting the specialists during busy situations and making key decisions affecting the area. East and West NTMOs direct the implementation of the Strategic Plan of Operations (SPO) within their areas, evaluate TM initiatives, and ensure that any initiatives that are deemed necessary and appropriate are implemented, revised, and canceled in a timely manner.

Each NTMO exchanges information with the other NTMOs and passes key information to the specialists in the area. NTMOs inform the NOM of any condition in their areas that may impact the NAS, including appropriate options and initiatives taken. NTMOs ensure that status information and all position logs are kept up-to-date and that communications with facility TMUs remain ongoing.

The NTMO uses OIS for staff assignments and to update restrictions and capacities. Additionally, the NTMO uses the same tools as the specialists within the area.

4.4.1.3 East and West Area Specialists

The East and West Area Specialists at the ATCSCC analyze and monitor air traffic flow, airport/weather conditions, and traffic forecasts throughout the NAS to ensure acceptable levels of traffic and to plan, direct, and approve traffic management initiatives. Area Specialists are Traffic Management Specialists (TMSs) assigned to either the East or West geographical areas of responsibilities. The East and West areas are aligned to Centers in the east or west side of the country. The Area Specialists focus on departure and arrival demand and runway configurations at major airports, significant weather, SUA activity status and schedules, special events, and en route traffic volume. They develop and evaluate alternatives to resolve specific demand/capacity problems in their designated geographical area, and they select the least restrictive alternative for implementation. Area Specialists handle user concerns, such as planned or current GSs and GDPs, and provide information on airports in their area concerning weather, de-icing, equipment outages, runway configurations or closures, arrival rates, curfews or any unusual circumstances. They also resolve TM related problems between AT facilities.

The East and West Area Specialists use the TSD, OIS, and CCFP for situation awareness. They update the OIS as necessary to ensure completeness and accuracy. FSM is used to monitor resource demand/capacity and to plan and monitor GDPs/GSs. DSP is used in the East Area to support New York TRACON MIT restriction requests. DSP's Airport Lineup display, which shows the departure fixes for departing flights, helps the specialist decide if an MIT restriction is necessary.

Position logging is done using the ETMS Log. TMLog is only used at one position, Position 22, in the West Area.

4.4.1.4 Severe Weather Management Specialist

The Severe Weather Management Specialist focuses on routes across the country, developing route alternatives during severe weather and during military operations. Severe Weather Management Specialists communicate the reroutes in effect to the Area Specialists. The actual reroutes are implemented at the ARTCCs. Severe Weather Management Specialists also address concerns from users relative to general routing and North American Route Program (NARP)/National Route Program (NRP) and serve as a focal point for implementation and coordination of the Severe Weather Avoidance Plan (SWAP). He/she also coordinates the use of Canadian airspace.

Severe Weather Management Specialists work through the NOM to coordinate activities with the military. When the NOM indicates that military activity is pending, the Severe Weather Management Specialist sends out a canned reroute advisory. The Severe Weather Management Specialist may also initiate requests to use military airspace to avoid severe weather through the NOM.

Severe Weather Management Specialists also work with the TCA to handle exemptions from the reroutes in effect and to locate reroutes using volunteer pathfinder flights. Exemptions and pathfinders are worked between the Severe Weather Management Specialist and the TCA on a case-by-case basis.

Major tools used by Severe Weather Management Specialists include the following:

- National Playbook and RMT for pre-approved routes and location identifier information; these tools provide a starting ground for planning reroutes (specialists often need to make changes to routes to avoid weather)
- ETMS Flight Evaluation Areas (FEAs) as starting points in finding the least disruptive routes around severe weather
- TSD to see all flights for airports affected by a reroute
- ETMS Autosend for sending advisories
- OIS for staff schedule information, Playbook access, and reference information (e.g., airport and equipment status, special operations)
- ETMS Log for logging reroutes and reroute exemptions
- DSP as a quick reference to determine airport delays and availability of viable routes (red status shows viable route is unavailable).

See Section 5.2.3, Assess and Implement Rerouting Strategies, for more discussion of Severe Weather Management Specialist's role in developing rerouting initiatives.

4.4.1.5 Weather Unit Specialist

The Weather Unit Specialist collects, interprets, and disseminates meteorological information. Dissemination is through ad hoc and scheduled weather briefings that provide all ATCSCC positions with the meteorological and aeronautical information they need to perform their jobs. The Weather Unit Specialist provides:

- Weather information for the pacing airports including both present and forecast conditions
- Areas of weather, both hazardous and severe, for dissemination to traffic management specialists responsible for specific geographical areas
- Continuous assessment and update of the overall weather picture, often using locally generated graphic weather data of current conditions
- Interpretation of Geo-synchronous Operational Environmental Satellite (GOES) data for facility use
- Interpretation and dissemination of thunderstorm and precipitation location and intensity from multiple weather radar displays.

The tools used by the Weather Unit Specialist include WARP, TSD, CCFP, and OIS for collection, interpretation, and analysis of weather phenomenon and the Aviation Weather Center (AWC) website for CCFP collaboration. National Oceanic and Atmospheric Administration (NOAA) and National Aviation Weather websites, as well as the TV Weather Channel, are used for meteorological assessment.

See Section 5.1.1, Acquire Environmental Information, for more discussion of weather information gathering.

4.4.1.6 Strategic Planning Team (SPT)

The Strategic Planning Team (SPT) members at the ATCSCC collaborate with other SPT members in the development of the Strategic Plan of Operations (SPO). Other SPT members include the airline strategic planners, FAA field operations managers, airport authorities, general aviation (GA) organizations, military airspace coordinators, and the FAA / AWC / airline weather forecasters.

The SPO is a comprehensive NAS plan of action covering the next 2 to 4 hours that is developed collaboratively by members of the SPT. The SPT meets by TELCON every 2 hours to review and update the SPO. The ATCSCC SPT members revise the SPO based on the information shared during the TELCON and post the plan on the ATCSCC Intranet website. The ATCSCC SPT conducts lessons learned reviews with the other SPT members once every 2 weeks. Feedback on the SPO is collected utilizing facility and ATCSCC logs and the SPO Feedback feature located on the ATCSCC Intranet web page.

The tools used by the ATCSCC SPT members include the TSD, OIS, CCFP, FSM, and the ATCSCC Intranet website.

See Appendix B for discussion of the Strategic Plan of Operations (SPO).

4.4.1.7 Tactical Consumer Advocate (TCA)

The Tactical Consumer Advocate (TCA) enhances air traffic system performance by serving as a customer advocate in accomplishing operations identified as critical by NAS users. The TCA is the point of contact for airlines to ensure that the airlines' key flights are given the needed priority within the system constraints established for the day. The TCA assists users in addressing requests for exemptions from TM initiatives for user-defined critical flights (e.g., early departure release for potential crew loss, alternate routing for flight with low fuel). Single flight issues are handled by the TCA, not the area specialists.

During severe weather events, the TCA coordinates all diversion recovery and pathfinder events with the airlines. The airlines inform the TCA of their diversion recovery flights and the TCA advises the centers of their special status. The airlines also volunteer specific flights to the TCA to be pathfinders. The TCA coordinates reroute exemptions and pathfinders with the Severe Weather Management Specialist on a case-by-case basis.

The vast majority of the airline calls referred to the TCA deal with GDP, equipment, FSM, and TSD problems. During severe weather events, the TCA sets up the User Hotline TELCON to allow CDM participants to communicate serious issues and for the TCA to prioritize and address the problems quickly. Only Category Types #1 and #2 issues such as facility outages, fuel issues, or crew loss are discussed during the User Hotline period. It is not unusual for the duration of a User Hotline TELCON to be between four and six hours.

Tools used by the TCAs to support the airlines include the following:

- TSD, CCFP, and OIS for overall situation awareness
- Multiple FSMs for rapid access to specific airport's demand chart
- Diversion Recovery Web Page (DRWP) for providing special treatment to diversion recovery flights and automatically sending diversion recovery advisories to the appropriate centers
- Pathfinder Web Page (PFWP) for coordinating pathfinder flights with the airlines during severe weather
- ARINC printer for route requests from the airlines
- ETMS Log for recording user issues received outside of the User Hotline period. Any handwritten notes from the User's Hotline discussions are not retained after the Hotline TELCON period.
- TCA Tool - At the end of Summer 2002, a TCA website was deployed to support the TCA position and the CDM users. It allows the CDM users to enter issues electronically during the User Hotline period, the TCAs to enter issue resolutions for

all CDM users to share, and the issues to be logged automatically. See Section 6.2.5.2.12 for discussion of the TCA Tool.

The TCA also assumes the responsibilities of the Airport Reservation Office (ARO). The Airport Reservation Office (ARO) processes all requests for IFR operations at designated High Density Traffic Airports and allots reservations on a first come, first served basis. The high-density traffic airports are John F. Kennedy International (JFK), LaGuardia (LGA), and Ronald Reagan Washington National (DCA). The ARO also allocates reservations to and from airports with above-normal traffic demand due to special events such as the Olympics, major Golf Tournaments, NASCAR events, etc. The TCA uses e-STMP and the Enhanced Computerized Voice Reservation System (e-CVRS) to make reservations and issues STMP advisories using ETMS Autosend.

TCA support is also described in Section 7.1, User and Facility Assistance Capabilities.

4.4.1.8 Notice to Airmen (NOTAM) Specialist

The NOTAM Specialist is responsible for the development, dissemination, and interpretation of operating procedures and practices to the local and regional organizational elements on the management of the US Notice to Airmen System (USNS). The NOTAM Specialist evaluates a steady stream of technological information, determines the relevance, identifies the importance/impact, and ensures dissemination to all interested/affected organizations and operating officials of time critical Notice to Airmen (NOTAM) information.

This position uses the following PC-based tools: Beehive publishing tool, Internet browser, and e-mail. Additionally, the NOTAM specialist relies on the phone, fax, and printer.

See Section 5.1.1, Acquire Environmental Information, for more discussion of NOTAMs.

4.4.1.9 Computer Systems Analyst (CSA)

The Computer Systems Analyst (CSA) assists ATCSCC TMU personnel by addressing problems with TFM systems and tools. The CSA provides the first line of support to resolve any data issues such as FSM substitution errors or network (ARINC and NADIN) problems.

Tools used at this position include the following:

- FSM for analyzing why unexpected flights are/are not receiving Expected Departure Clearance Times (EDCTs)
- TSD for analyzing why flights and/or weather are not updating at a specific position
- OIS Summary Page for monitoring current GDPs and GSs
- ATCSCC Intranet for accessing Advisories Database
- CVRS for monitoring CVRS heartbeat status

- TMShell to verify that the Official Airline Guide (OAG) schedule and the ETMS Traffic Database (TDB) for specific airports are consistent (if not, Volpe may need to perform a cross-string recovery)
- CDM DataGate to verify all airline connections are working properly
- Watchdog (a homegrown tool) for status of network connections
- ClassView (local tool developed by Kenrob and Associates) for monitoring ongoing GDPs
- Replication Monitor Tools (local tool developed by Kenrob and Associates) for monitoring the last update times of the three ATCSCC Intranet and Internet servers.

See also Section 7.1, User and Facility Assistance.

4.4.1.10 Central Altitude Reservation Function (CARF) Specialist

The CARF specialist is responsible for planning and coordinating military Altitude Reservations (ALTRVs) and large-scale movements of military aircraft.

An ALTRV reserves a 3-dimensional block of airspace during a specific timeframe for the conduct of special military activities. An ALTRV request receives special handling from FAA facilities. When an ALTRV is requested, the military contacts the ATCSCC CARF specialist. The CARF specialist works with the affected ARTCCs to ensure that the ALTRV is not in conflict with the traffic flow, available routes, military missions, and other operations that propose to use the requested airspace. If there is a conflict, the ALTRV is not approved and the CARF specialist works with the military to resolve the conflicts.

The CARF specialist uses the CARF computer supplied by the military to identify and resolve conflicts among multiple ALTRV reservations. Just prior to and during the actual mission, the CARF specialist uses the TSD and FSM to monitor the flight activity in the vicinity of the CARF mission. See also Section 5.3.2, Planning for Special Government Events, for additional information on CARF support.

4.4.2 ARTCC Traffic Management Positions

Traffic Management Units at ARTCCs consist of Traffic Management Coordinators (TMCs) and Supervisory Traffic Management Coordinators (STMCs) whose duties are to monitor for demand/capacity imbalance within their centers, plan and implement approved Traffic Management Initiatives (TMIs) in conjunction with, or as directed by, the ATCSCC, and evaluate TMIs for effectiveness.

At the Chicago Center (ZAU), the TMU consists of the following positions:

- Supervisory Traffic Management Coordinator
- Enroute Coordinator
- Arrival Coordinator

- Departure Coordinator
- Restriction Coordinator.

At the Washington Center (ZDC), the TMU consists of these positions:

- Supervisory Traffic Management Coordinator
- Weather Coordinator
- Shift Coordinator
- Departure Coordinator
- Enroute Spacing Coordinator
- Monitor Alert Coordinator
- W20 Hotline Coordinator
- Floor Walker.

See the TFM Tools/Products Usage Table at the beginning of Section 6, TFM Tools and Products, for a list of tools and products used by ZAU and ZDC TM positions as well as the tools and products intended for use at all ARTCC TMUs.

4.4.3 TRACON Traffic Management Positions

At the Southern CAL TRACON (SCT), the TMU consists of these positions:

- Supervisory Traffic Management Coordinator
- Los Angeles Coordinator
- Seal Beach Coordinator
- Satellite Operations Coordinator
- Operations Floor Coordinator.

At the New York TRACON (N90), the TMU consists of three positions:

- Arrival Director
- Departure Director
- Traffic Management Director.

See the TFM Tools/Products Usage Table at the beginning of Section 6, TFM Tools and Products, for a list of tools and products used by SCT and N90 TM positions as well as the tools and products intended for use at all TRACON TMUs.

4.4.4 Tower Traffic Management Positions

Tower traffic management specialists work with the ARTCC and TRACON TMCs to implement traffic management initiatives such as departure sequencing and Approval Requests (APREQs). The eight highest activity towers (see list in Section 4.3.5, Air Traffic Control Towers) use tools such as ETMS and DSP (where installed) to increase situational awareness of pending arrivals and departures. Other towers use WSD to obtain traffic demand and constraint information.

See the TFM Tools/Products Usage Table at the beginning of Section 6, TFM Tools and Products, for the list of tools and products intended for use at the ATCTs.

4.5 TFM Users

Users of traffic flow management services include the airlines, the military, other FAA and government agencies, and general aviation (GA).

4.5.1 Airlines

The scheduled airlines are the biggest users of traffic flow management services. The primary airline interface with TFM is through their Air Traffic Coordinators and Dispatchers. TFM Tools used by the airlines include CCSD, FSM, the ATCSCC Intranet Website, and the Volpe DataGate website. The AT Coordinators and Dispatchers use these tools to access the SPOs, Severe Weather Reroute Advisories, and EDCT reports.

4.5.1.1 Air Traffic Coordinators

The airline's Air Traffic Coordinator is recognized as a generic term for an airline employee who represents his/her airline as a liaison between the airline and FAA ATM. The AT Coordinator is the interface between the ATCSCC and his/her airline's Dispatchers, and is the person that the ATCSCC apprises when delays are expected to exceed 15 minutes. The AT Coordinator participates in the TCA's Hotline discussions to raise issues about flights relevant to the airline's operation during severe weather events. The Coordinator ensures that Simplified Substitutions are submitted during a Ground Delay Program and monitors for changes that may adversely impact compliance with controlled departure times.

4.5.1.2 Dispatchers

The airline Dispatcher provides weather updates and flight plan analysis to the flight crew. The Dispatcher and pilot-in-command are jointly responsible for planning around and avoiding known or forecasted weather phenomena that may affect the safety of the flight. The Dispatchers are generally the flight crew's first point of contact in the event of a mechanical, medical or aircraft emergency. It is the Dispatcher who will come to the aid of the flight crew with any assistance requested by the pilot-in-command. The Dispatcher monitors TFM advisories and keeps the flight crew informed of any changes to departure times.

4.5.2 Military

The Department of Defense (DOD) assigns staff to the various FAA ATC facilities to coordinate military activities with ongoing ATM activities. The military staff at the FAA facilities provides daily written reports to TM specialists regarding the Special Use Airspace (SUA) activity scheduled for the day. Local traffic managers are responsible for entering daily SUA activity into the Special Use Airspace Management System (SAMS) for post analysis.

ATCSCC military staff submits written ALTRV requests to the CARF position and works with the CARF position to resolve ALTRV conflicts. Additionally, the military has installed equipment (e.g., the Military Airspace Management System (MAMS), CARF computer) at the ATCSCC to support mission planning.

ETMS is installed in some military installations and other military installations access ETMS information via the Web-Based Situation Display (WSD) through a secure military network or controlled Internet access.

The North American Aerospace Defense Command (NORAD) receives ETMS data directly from Volpe. Each FAA ATC facility has a secure Hotline with NORAD installed.

4.5.3 Other FAA and Government Agencies

Nine regional FAA offices have ETMS remote site installations. They receive and display tactical data from the Volpe Hub, but normally do not originate tactical data.

The ATCSCC NOM conducts a daily TELCON with FAA Headquarters (ATT-1 Air Traffic Tactical Operations) to discuss the overall operation for the previous day and to follow-up on issues from previous meetings.

AT personnel are responsible for reporting delays of 15 minutes or more that occur in facilities or airspace under their control. The cause of the delay, as well as the type of aircraft involved (commercial, air taxi, general aviation, or military), and the duration of the delay are included in the daily reporting system. The Air Traffic Operations Network (OPSNET) is utilized for the purpose of submitting these reports electronically, as well as receiving summary reports and information from the ATT-1 in FAA Headquarters.

FAA Headquarters also has access to the Volpe DataGate web site with access to the TM Data Quality Database.

Access to ETMS data is not restricted to the FAA and the airlines. Many non-FAA government agencies have read-only access to ETMS information through WSD displays, lists and reports.

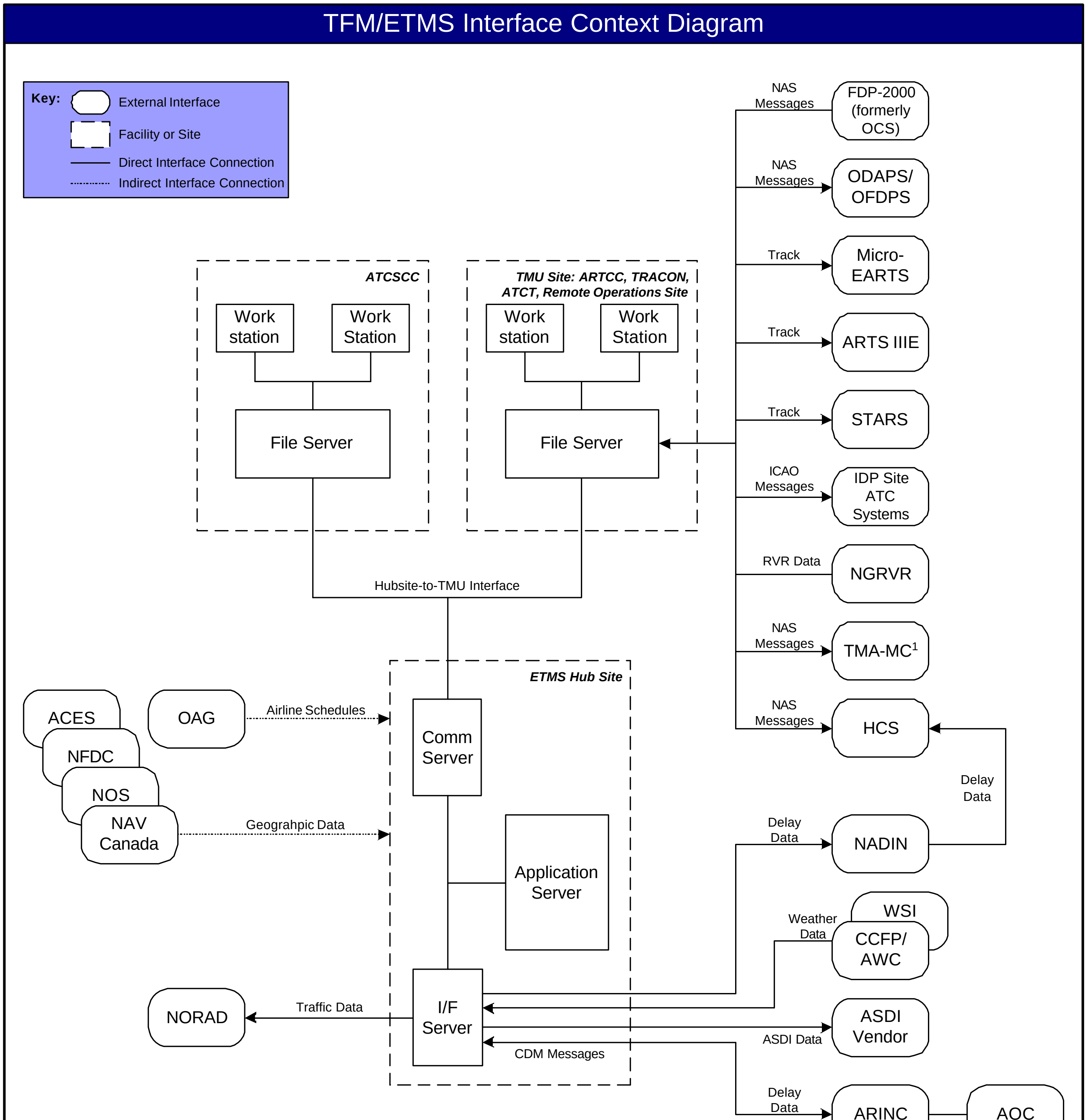
4.5.4 General Aviation

For special events, such as major sporting events or business conventions, that can attract thousands of people and aircraft to a particular airport, the FAA requires pilots to make arrival and/or departure reservations prior to using a participating airport. The ATCSCC Internet website allows the general public to request arrival and departure slots at a particular airport or group of airports using the e-STMP tool. Also for reservations into any High Density Traffic Airports, the Computerized Voice Reservation System (e-CVRS) is available for the general aviation community to use any time. See Section 5.3.3, Plan for Special Civilian Events, for additional information on services for general aviation.

4.6 TFM Interfaces

Although many applications comprise the TFM system, the ETMS application is at the heart of the system and all TFM interfaces, other than user-supplied input, are through ETMS.

Exhibit 4-5. TFM/ETMS Interface Context Diagram displays the various interfacing systems and how they interact with ETMS. External systems connect to either the interface server (I/F Server) processors at the ETMS Hubsite, or with the fileservers in TMUs collocated with Air Traffic Control (ATC) systems. The ETMS Hubsite-to-TMU interface joins the communication servers at the Hub and the fileservers in the TMUs. In this exhibit, the round-cornered boxes identify the external systems with interfaces, the solid connection lines denote the interfaces that have a direct electronic connection to ETMS, the dotted connection lines denote the interfaces that are received indirectly on electronic media outside of the ETMS WAN, and the large dashed boxes present an abstract of the ETMS Hubsite, the ATCSCC, and TMU systems for illustration of the interfaces.



[1] TMA-MC is a future interface. Deployment to 4 centers is scheduled for Winter 2002/2003. It will be even longer before TMA-MC goes operational.

Exhibit 4-5. TFM/ETMS Interface Context Diagram

TFM interfaces are described in the following subsections:

- Section 4.6.1, ETMS External Interfaces, describes the interfaces that are external to the TFM-I domain.
- Section 4.6.2, ETMS Internal Interfaces, describes the interfaces that are internal to ETMS within the TFM-I domain.

Interfaces between the various TFM tools within the TFM-I domain are described within each tool description in Section 6, TFM Tools and Products.

4.6.1 ETMS External Interfaces

This section contains a description of the following major ETMS external interfaces:

- HCS (Canada also uses this interface)
- ARTS IIIE
- STARS
- ODAPS / OFDPS
- FDP-2000 (formerly OCS)
- International Data Provider Sites (i.e., London and Mexico)
- NORAD
- TMA-MC
- Micro-EARTS
- ARINC
- NADIN
- WSI
- CCFP / AWC
- OAG
- NGRVR
- ASDI
- ACES
- NFDC
- NOS
- NAV CANADA.

Each interface description includes a high level view of the purpose of the interface and the type of data transmitted / received.

Security. Among the ETMS external systems, WSI, AWC, ARINC, OAG, NOS, and NavCanada are outside the FAA domain. The ETMS uses FAA information security guidelines in accordance with the ETMS System Security Plan, FAA Order 1370.82 (i.e., FAA Information Systems Security Program), and FAA-STD-045 (i.e., OSI Security Architecture, Protocol and Mechanisms) to enact security strategies and measures on all data incoming from commercial systems outside of the FAA Domain.

All other ETMS external systems are FAA systems. No additional security procedures are required on the information flow between ETMS and these FAA systems, except that they adhere to standards and guidelines provided by the ETMS Security Plan, FAA Order 1370.82 (i.e., FAA Information Systems Security Program), and FAA-STD-045 (i.e., OSI Security Architecture, Protocol and Mechanisms).

Additional References. See the relevant Interface Requirements Documents (IRDs) in Section 2, Document References, for more detailed information about each external interface. Also, see Section 13.5, External Communications Functions, of the *ETMS Functional Description, Version 7.4*, for a detailed description of the ETMS software that handles external interfaces requiring a protocol driver and converter to exchange information with ETMS.

4.6.1.1 ETMS to HCS Interface

This interface provides for the exchange of NAS messages between the 20 Host Computer Systems (HCSs) and the ETMS through the TMUs collocated at the ARTCCs. HCS provides ETMS with flight plans and real time event data (departures, arrivals, position updates, and airspace assignment information) from the ARTCCs. ETMS sends estimated departure clearance times messages (CT) to HCS. Exhibit 4-6. ETMS-to-HCS Interface Table summarizes the messages exchanged between ETMS and HCS. The details of the connectivity between the TMU and the HCS are described in detail in NAS-MD-850.

Canada provides flight messages to ETMS in NAS message format and follows the ETMS to HCS interface description summarized in this section.

4.6.1.2 ETMS to ARTS IIIE Interface

This interface provides exchange of local track data messages between the Automated Radar Terminal System IIIE (ARTS IIIE) and the ETMS through the TMU collocated at the terminal facility. ATC-61015 describes the connectivity between ETMS and ARTS IIIE in detail. ETMS receives track updates for flights in the terminal areas via this interface.

Exhibit 4-7. ETMS-to-ARTS IIIE Interface Summary Table summarizes the messages exchanged between ETMS and ARTS III. Messages can be initiated from either side of the interface. The flow of messages between ETMS and ARTS IIIE is bi-directional.

- The ETMS receives local track data messages and the test messages and data test messages from ARTS IIIE.
- The ETMS sends data test messages, test messages, and acceptance/rejection response messages to the ARTS IIIE.

Exhibit 4-6. ETMS-to-HCS Interface Table

Message Description	Message Mnemonic	Direction of Message
Flow Control Track/Flight Data Block	TZ	HCS to ETMS
Flow Control Beacon Code Information	BZ	HCS to ETMS
Departure	DZ	HCS to ETMS
Flow Control Flight Plan Information	FZ	HCS to ETMS
Flow Control Boundary Crossing	UZ	HCS to ETMS
Flow Control Amendment	AF	HCS to ETMS
Flow Control Cancellation	RZ	HCS to ETMS
Estimated Departure Clearance Time	CT	ETMS to HCS
Central Flow Airspace Assignment	CZ	HCS to ETMS
Sector Assignment request	RC	ETMS to HCS
Arrival	AZ	HCS to ETMS
Transmission Accepted	DA	Both ways
Transmission Rejected	DR	Both ways
Retransmit	DX	Both ways
Data Test	DT	Both ways
(Interface) Test	TR	Both ways
Sources: ETMS SDD Volume 2, Sections 24 and 27; NAS-MD-311; NAS-MD-315; NAS-MD-850		

Exhibit 4-7. ETMS-to-ARTS IIIE Interface Summary Table

Message Description	Message Mnemonic	Direction
Flow Control Track/Flight Data Block	TZ	ARTS to ETMS (NAS Driver)
Transmission Accepted	DA	ETMS (NAS Driver) to ARTS IIIE
Transmission Rejected	DR	ETMS (NAS Driver) to ARTS IIIE
Data Test	DT	Both ways
(Interface) Test	TR	Both Ways
Source: ATC-61015, Section 9; NAS-MD-640		

4.6.1.3 ETMS to STARS Interface

This interface provides for the exchange of track data messages between the ETMS and the Standard Terminal Automation Replacement System (STARS). ETMS receives track updates for flights in the terminal areas with the STARS system via this interface. This interface is described in detail in NAS-IC-21052100. For those terminal facilities not having a TMU, STARS communicates with the TMU collocated at the ARTCC through the en route HCS. The connectivity between HCS and STARS is described in detail in NAS-IC-21058217.

Exhibit 4-8. ETMS-to-STARS Interface Summary Table summarizes the messages exchanged between ETMS and STARS. Messages can be initiated from either side. The flow of messages between ETMS and STARS is bi-directional.

- The ETMS receives local track data messages, test messages and data test messages from STARS.
- The ETMS sends Accept/Reject messages and test messages and data test messages to STARS.

Exhibit 4-8. ETMS-to-STARS Interface Summary Table

Message Description	Message Mnemonic	Direction
Flow Control Track/Flight Data Block	TZ	STARS to ETMS
Transmission Accepted	DA	ETMS to STARS
Transmission Rejected	DR	ETMS to STARS
Data Test	DT	Both ways
(Interface) Test	TR	Both ways
Source: NAS-IC-21052100		

4.6.1.4 ETMS to ODAPS/OFDPS Interface

This interface provides the exchange of flight plan information and flow control messages between ETMS and the Oceanic Display and Planning System (ODAPS) by way of the TMU collocated at the New York and Oakland ARTCCs. Because the Offshore Flight Data Processing System (OFDPS) that runs in Honolulu is a modified version of ODAPS, the ETMS to OFDPS interface is identical to it.

Exhibit 4-9. ETMS-to-ODAPS/OFDPS Interface Summary Table summarizes the messages exchanged between ETMS and ODAPS/OFDPS. Messages can be initiated from either side. The flow of messages between ODAPS/OFDPS and ETMS is bi-directional.

- ETMS receives flight information messages for proposed and/or active flight plans from the ODAPS/OFDPS.
- ETMS exchanges test, data test, accept/reject, and retransmit messages with the ODAPS/OFDPS.

Exhibit 4-9. ETMS-to-ODAPS/OFDPS Interface Summary Table

Message Description	Message Mnemonic	Direction
Flow Control Track/Flight Data Block	TZ	ODAPS/OFDPS Processing Function to ETMS NAS Driver
Flow Control Beacon Code Information	BZ	ODAPS/OFDPS Processing Function to ETMS NAS Driver
Flow Control Flight Plan Information	FZ	ODAPS/OFDPS Processing Function to ETMS NAS Driver
Departure	DZ	ODAPS/OFDPS Processing Function to ETMS NAS Driver
Flow Control Cancellation	RZ	ODAPS/OFDPS Processing Function to ETMS NAS Driver
Arrival	AZ	ODAPS/OFDPS Processing Function to ETMS NAS Driver
Flow Control Amendment	AF	ODAPS/OFDPS Processing Function to ETMS NAS Driver
Flow Control Update Information	UZ	ODAPS/OFDPS Processing Function to ETMS NAS Driver
Transmission Accepted	DA	Both ways
Transmission Rejected	DR	Both ways
Retransmit	DX	Both ways
Data Test	DT	Both ways
(Interface) Test	TR	Both ways
Sources: Volpe Center-DTS56-TMS-9708.x; NAS-MD-4309, Sections 2.5 and 2.6.3		

4.6.1.5 ETMS to FDP-2000 (Formerly OCS) Interface

This interface provides for the transfer of NAS messages (flight plans, departure, and arrival messages except the track control TZ messages) from FDP-2000 (formerly, the Alaskan Offshore Computer System (OCS)) to the ETMS by way of the TMU collocated at the Anchorage ARTCC facility.

The ETMS receives NAS messages, except the TZ messages, from FDP-2000. All messages are alphanumeric.

Exhibit 4-10. ETMS-to-FDP-2000 Interface Summary Table summarizes the messages exchanged between ETMS and FDP-2000. The flow of messages between ETMS and FDP-2000 is unidirectional.

Exhibit 4-10. ETMS-to-FDP-2000 Interface Summary Table

Message Description	Message Mnemonic	Direction
Departure	DZ	FDP-2000 Processing Function to ETMS
Flow Control Flight Plan Information	FZ	FDP-2000 Processing Function to ETMS
Flow Control Amendment	AF	FDP-2000 Processing Function to ETMS
Flow Control Cancellation	RZ	FDP-2000 Processing Function to ETMS
Arrival	AZ	FDP-2000 Processing Function to ETMS
Beacon Code Assignment	BZ	FDP-2000 Processing Function to ETMS
Boundary Crossing	UZ	FDP-2000 Processing Function to ETMS
Source: ZAN OCS ICD Summary, Rev 2.2		

4.6.1.6 ETMS to International Data Provider (IDP) Site Interface

This interface provides for the transfer of flight information from the International Data Provider (IDP) sites to ETMS using Transmission Control Protocol/Internet Protocol (TCP/IP). The information is transferred in International Civil Aviation Organization (ICAO) format. Currently, the IDP sites include London and Mexico. Because flight messages received from Canada are transferred via a dedicated leased line and are formatted as NAS messages, Canada is not considered an IDP site.

London and Mexico send and receive data using a VPN circuit between the site and ETMS. The VPN is established through the Internet. The only Internet services provided are data transport and switching associated with the VPN. There is no dependence on the Internet Service Provider (ISP) for security services. The IDP sites and ETMS secure the connection by establishing a firewall-based VPN through the Internet.

The IDP to ETMS interface uses ICAO message types. All messages are alphanumeric. The table below lists the supported ICAO messages and the derived ETMS data types.

Exhibit 4-11. ETMS-to-IDP Site Interface Summary Table

Message Description	ICAO Mnemonic	Derived ETMS Data Type	Direction
Flight Plan	FPL/CPL/RPL	FZ	IDP Site to ETMS
Flight Plan Modification	CHG	AF	IDP Site to ETMS
Departure	DEP	DZ	IDP Site to ETMS
Arrival	ARR	AZ	IDP Site to ETMS
Track Position	N/A	TZ	IDP Site to ETMS
Cancel	CNL	RZ	IDP Site to ETMS
Clearance	CLR	N/A	IDP Site to ETMS
Delay	DLY	N/A	IDP Site to ETMS
The actual message formats are detailed in NAS-MD-315 External Outputs and ICAO Annex 11.			

4.6.1.7 ETMS to NORAD Interface

This interface provides for the transfer of ETMS flight data to NORAD. As explained in Section 4.3.1.1, the information transferred is a modified ETMS feed. More details of the information exchanged are unavailable.

4.6.1.8 ETMS to TMA-MC Interface

The ETMS-to-TMA-MC is a future interface. TMA-MC is scheduled to be deployed in 4 centers (ZNY, ZOB, ZDC, ZNY) in Winter 2002/2003. The interface is described here in order to remain consistent with existing ETMS interface documentation.

The ETMS-to-TMA-MC interface provides an exchange of message data from ETMS to TMA-MC using standard TCP/IP protocols. Information is transferred from an ETMS file server to a TMA-MC file server. The ETMS and TMA-MC file servers are located at an ARTCC.

The ETMS process, FTM Connect, implements the ETMS to TMA-MC interface using a socket connection initiated by the TMA-MC server. FTM Connect exists independently of the TMA-MC interface. It receives flight data from the ETMS Flight Table Manager (FTM) and transmits it to the server that initiated the socket connection. In the case of TMA-MC, this is the TMA-MC server.

Exhibit 4-12. ETMS-to-TMA-MC Interface Summary Table summarizes the messages exchanged between ETMS and TMA-MC.

Exhibit 4-12. ETMS-to-TMA-MC Interface Summary Table

Message Description	Message Mnemonic	Direction
Track data	Information Not Available	ETMS FTM Connect to TMA-MC
Route data	Information Not Available	ETMS FTM Connect to TMA-MC
Time data	Information Not Available	ETMS FTM Connect to TMA-MC
Position data	Information Not Available	ETMS FTM Connect to TMA-MC
Block alt data	Information Not Available	ETMS FTM Connect to TMA-MC
Track Table Manager and Flight Table Manager (TTM-FTM) data	Information Not Available	ETMS FTM Connect to TMA-MC
Critical data (this data is summary flight information needed for traffic management control)	Information Not Available	ETMS FTM Connect to TMA-MC
Source: CSC/E3-20/0185 ETMS to TMA –MC ICD		

4.6.1.9 ETMS to Micro-EARTS Interface

This interface provides for the exchange of track data messages between the ETMS and the Alaskan En-Route Automated Radar Tracking System (Micro-EARTS) by way of a TMU collocated at Anchorage ARTCC facility. This ARTCC does not have a Host Computer System. Instead, Micro-EARTS provides the same services and functions as the HCS. Micro-EARTS also supplies position reports from San Juan, Honolulu, and Guam. The connectivity between Micro-EARTS and ETMS connectivity is described in detail in DTS56-TMS-9511.2.

Exhibit 4-13. ETMS-to-Micro-EARTS Interface Summary Table summarizes the messages exchanged between ETMS and Micro-EARTS. The flow of messages between ETMS and Micro-EARTS is bi-directional.

- ETMS receives track data messages for each actively tracked aircraft and test messages from the Micro-EARTS processors in Anchorage, Honolulu, San Juan, and Guam.
  - Track data messages are received for each active aircraft during an adapted time interval of 1, 2, 3 or 5 minutes.
  - During this adapted period, only one track data message is received for each aircraft.
- Test messages are received once every 60 seconds for the duration of the scheduled test.
- ETMS responds to test messages by sending a data test message to Micro-EARTS within 5 seconds of the receipt of each Micro-EARTS test message.

Exhibit 4-13. ETMS-to-Micro-EARTS Interface Summary Table

Message Description	Message Mnemonic	Direction
Flow Control Track/Flight Data Block	TZ	Micro-EARTS Processing Function to ETMS
Data Test	DT	Micro-EARTS Processing Function to ETMS
(Interface) Test	TR	Micro-EARTS Processing Function to ETMS
Source: Volpe-Center-DTS56-TMS-9511.2, Section 4.5.1		

4.6.1.10 ETMS to ARINC Interface

This interface provides for the exchange of Estimated Departure Clearance Times (EDCT), general messages, advisory messages, flight substitution request messages (SI), and SI response messages, and Oceanic position reports between ETMS and the airlines by way of Aeronautical Radio, Inc. (ARINC). The ARINC performs the role of the data communications medium, delivering the messages between the airlines and the ETMS.

Messages from ETMS originate from two sources within ETMS. These are the ATCSCC and the Hub. EDCT, General Information, and Advisory messages originate from the ATCSCC and are sent to the Hub where they are injected into the ARINC circuit. Replies to airline substitution messages originating at the Hub are sent to the airlines.

Exhibit 4-14. ETMS-to-ARINC Interface Summary Table summarizes the messages exchanged between ETMS and ARINC. The flow of messages between ETMS and ARINC is bi-directional.

Exhibit 4-14. ETMS-to-ARINC Interface Summary Table

Message Description	Message Mnemonic	Direction
Estimated Departure Clearance Time (ATCSCC only)	CT	ETMS to ARINC Processing Function
General and Advisory Message (ATCSCC only)	Unavailable to audit team	ETMS to ARINC Processing Function
Flight Substitution/Insertion Requests	SI	ARINC Processing Function to ETMS
SI Replies	Unavailable to audit team	ETMS to ARINC Processing Function
Oceanic Position Reports	Unavailable to audit team	ARINC Processing Function to ETMS TSD DOTS
Source: ETMS SDD Volume 1, Section 3.1		

4.6.1.11 ETMS To NADIN Interface

This interface provides for the exchange of the EDCT advisory messages and the Fuel Advisory (FA) messages between the ETMS and HCSs located within the various ARTCCs by way of the National Airspace Data Interchange Network (NADIN) 1A.

Exhibit 4-15. ETMS-to-NADIN Interface Summary Table summarizes the messages exchanged between ETMS and NADIN. The flow of messages between ETMS and NADIN is unidirectional.

Exhibit 4-15. ETMS-to-NADIN Interface Summary Table

Message Description	Message Mnemonic	Direction
Fuel Advisory Message (FAD Flow) (From ATCSCC TMU Position only)	FA	ETMS to NADIN
General and Advisory (From ATCSCC TMU Position Only)	Unavailable to audit team	ETMS to NADIN

4.6.1.12 ETMS to WSI Interface

This interface provides one-way data transfer of Rapid Update Cycle (RUC) grid winds data and other weather products from Weather Systems Incorporated (WSI) to ETMS via satellite or ground line link. The data received is in the form of grid winds, current terminal surface observations including volcanic and Aviation Routine Weather Report (METAR)/Terminal Aerodrome Forecast (TAF) text messages, radar information including cloud tops and volcanic activity, and lightning reports. The grid winds are used to compute flight times. The terminal weather text messages, radar information, and lightning reports are used for display purposes.

The alphanumeric messages are: TAF/METAR messages and volcanic messages. The other messages are binary.

Exhibit 4-16. ETMS-to-WSI Interface Summary Table summarizes the messages exchanged between ETMS and WSI. The flow of messages between ETMS and WSI is unidirectional.

Exhibit 4-16. ETMS-to-WSI Interface Summary Table

Message Description	Message Mnemonic	Direction
TAF/METAR/Volcano Text Messages	None/File	WSI Processing Function to ETMS
RUC Grid Winds	None/File	WSI Processing Function to ETMS
Radar Images	None/File	WSI Processing Function to ETMS
Lightning Data	None/File	WSI Processing Function to ETMS

4.6.1.13 ETMS to CCFP/AWC Interface

TFM processes Collaborative Convective Forecast Product (CCFP) data from the National Weather Service's (NWS) Aviation Weather Center (AWC) by storing the forecast data in two, four, and six hour forecast segments.

The interface to the AWC for CCFP is maintained at the Volpe Hubsite. A process sitting outside of the ETMS firewall polls a server at the AWC looking for new CCFP files. A new file is generated every 2 hours during the severe weather season, which is April through October. Each file contains a two-hour, four-hour, and six-hour forecast. When a new file is detected, the file is transferred to Volpe using File Transfer Protocol (FTP). Once at the Hubsite, the file is transferred through the firewall to a DMZ node where it is integrity checked. If no problems are detected, the file is transferred to the ETMS weather server and then distributed throughout the ETMS network using the same distribution mechanisms as all other weather files.

Exhibit 4-17. ETMS-to-AWC Interface Summary Table summarizes the information transferred between ETMS and the AWC. The flow of messages between ETMS and the AWC is unidirectional.

Exhibit 4-17. ETMS-to-AWC Interface Summary Table

Message Description	Message Mnemonic	Direction
CCFP file	None/File	AWC to ETMS via an FTP process initiated at the ETMS Hubsite

4.6.1.14 ETMS to OAG Interface

The ETMS-to-OAG interface utilizes File Transfer Protocol (FTP) to obtain airline-scheduling information from the Official Airline Guide (OAG) using a secure connection. TFM receives weekly updates of scheduled flight plans of all flights arriving, departing, or over-flying the United States, Canada, or England. This is a receive-only interface.

The OAG operational data is routinely posted in the airline flight stage file on a secure FTP server located at the OAG. The ETMS transfers the airline flight stage file at a specified day and time each week through an Internet connection. The flight stage file contains the flight schedules for the various airlines. Each flight stage record contains data pertaining to a specific flight. The file routinely contains 28 days worth of information. The file is a compressed ASCII file.

Authorized ETMS users logon to the OAG's FTP server via a PC connected to a Volpe public-accessible LAN and initiate the FTP transfer. After the flight stage file is received at Volpe, the schedule data is extracted, processed, and transferred to a server on the secure ETMS LAN.

Exhibit 4-18. ETMS to OAG Interface Summary Table summarizes the information transferred between ETMS and the OAG. The flow of messages between ETMS and OAG is unidirectional.

Exhibit 4-18. ETMS to OAG Interface Summary Table

Message Description	Message Mnemonic	Direction
Flight Stage Records	None/File	OAG FTP Server to ETMS FTP Client
Source: CSC/E2-99/7273 ETMS to OAG ICD		

Files received every week from the OAG contain the following data for each flight entry:

- List Number
- Departure country code
- Departure airport
- Departure time (Coordinated Universal Time - UTC)
- Arrival country code
- Arrival airport
- Arrival time (UTC)
- Flag code
  - 0 - any carrier; departing and arriving outside the US
  - 1 - domestic carrier; departing and arriving in the US
  - 2 - domestic carrier; departing or arriving but not both in US
  - 3 - international carrier; departing and arriving in the US
  - 4 - international carrier; departing or arriving but not both in the US
- Aircraft type code
- Airline code
- Flight number
- Days of service - Sunday through Saturday, 1 if scheduled, 0 if not
- Taxi or intrastate flight flag
- Effective date - date flight begins within period of this file
- Discontinue date - date flight ends within period of this file

4.6.1.15 ETMS to NGRVR Interface

This interface provides for the one-way data transfer of Runway Visual Range (RVR) data from the New Generation Runway Visual Range (NGRVR) System to the ETMS primary and backup TMU fileservers located at TRACONs.

The NGRVR system provides visual range products at specific points along a precision runway, enabling operators to determine the Visual or Instrument category under which the airport is operating. The category is then supplied to pilots for approach decisions. The NGRVR system measures three parameters to calculate runway visual range:

- Ambient light intensity
- Atmospheric extinction coefficient
- Runway centerline/edge light intensity

These parameters are collected and processed by the NGRVR Data Processing Unit (DPU) at each airport, resulting in RVR product values. The DPU transmits this data to the primary and back-up ETMS file servers situated within each TRACON. There are two possible configurations.

1. Co-located TRACON: The airport is physically co-located within the TRACON, and its RVR DPU is connected to the TRACON's ETMS fileservers.
2. Remote TRACON: The ETMS file servers receive data from up to a maximum of 16 airport RVR DPUs through a modem connection.

Exhibit 4-19. NGRVR-to-ETMS Interface Summary Table summarizes the messages exchanged between ETMS and the NGRVR system. The flow of messages between ETMS and the NGRVR system is unidirectional.

Exhibit 4-19. NGRVR-to-ETMS Interface Summary Table

Message Description	Message Mnemonic	Direction
Application Data Unit Message (each ADU message contains data pertaining to a maximum of 12 runways for an airport)	ADU	RVR DPU to TRACON ETMS File Server
Source: CSC/E3-01/NNN ETMS to NGRVR ICD		

4.6.1.16 ETMS to ASDI Interface

Aircraft Situational Display to Industry (ASDI) is a data feed from the FAA that provides airlines and other aviation-related organizations with access to a subset of near real-time air traffic data (for IFR commercial and general aviation traffic) across the NAS.

The ASDI feed is based around a client-server architecture. The ASDI server is at Volpe Center. The ASDI server registers with ETMS to receive the flow of raw data from ETMS, filters out sensitive flights and message types before sending the data through a firewall to registered clients, the airline industry related vendors.

The ASDI data feed includes the following message types:

- FZ (Flight Plan)
- AF (Flight Plan Amendments)
- DZ (Departures)
- UZ (Boundary Crossings)
- TZ (Track Updates)
- AZ (Arrivals)
- RZ (Cancellations)
- TO (Oceanic Track Updates)
- RT (Route Messages for every FZ, AF and UZ).

See Section 6.2.3 for a more detailed description of the ASDI product.

4.6.1.17 Geographical Data Interfaces (ACES, NFDC, NOS, NAV CANADA)

ETMS derives its maps database and grid database primarily from geographical data files received every 56 days from four sources:

1. Adaptation Controlled Environment Systems (ACES) of the 20 ARTCCs
2. National Flight Data Center (NFDC) of the FAA
3. National Ocean Service (NOS) of the National Oceanic and Atmospheric Administration (NOAA)
4. NAV CANADA and Canadian ETMS sites.

ETMS' interface for the geographical data from ACES, NOS, NFDC, and the Canadian sources is not direct. After receiving these files on magnetic tapes, CD ROM, and the Internet, ETMS transfers them onto computers at the Hubsite and extracts and/or converts the required data. ETMS combines the ACES, NOS, NFDC, and the Canadian site data to produce graphic display overlays (i.e., the Maps Database) and for internal data processing (i.e., the Grid Database). This data includes boundaries, sectors, ARTCC boundaries, TRACONs, airways, fixes, Navigational Aids (NAVAIDs), Airports, and Special Use Airspace (SUA) definitions.

4.6.1.17.1 Geographical Data from ACES

The following data is received from ACES:

- Fixes - reporting points in the US, including aliases and holding fixes
- Landing facilities - airports in the US
- Airspaces - sectors in the US

- Airways - US airways
- Metering data - US metered airports.

4.6.1.17.2 Geographical Data from NFDC

The following data files are received from the NFDC:

- Landing facilities - an entry for every landing facility in the US. Each entry is a listing of all known data for a facility, such as location, type (airport, seaport, heliport), type of traffic, hours of operation, light and marker types and locations, runway layouts, and number of operations last year.
- Navigation aids - a description of each FAA defined NAVAID, including some foreign and all domestic NAVAIDs. File format includes name, type, location, magnetic variation, and usage.
- Airspace fixes - a description of each reporting point in the US. File format includes name, type, location, usage, and fix-radials used to identify the fix.
- SUA (Special Use Airspace; formerly known as Military Areas) boundaries - the boundaries for SUAs grouped by the five types: alert areas, Military Operation Areas (MOAs), prohibited areas, restricted areas, and warning areas. Each SUA definition includes the name, the hours of operation, and the altitude limits, followed by a set of boundary points in latitude and longitude.
- Coded Departure Routes – a description of severe weather routes. These routes, which are defined on a city-pair basis by the ARTCCs, provide multiple routing alternatives for avoiding severe weather.

4.6.1.17.3 Geographical Data from NOS

The following data is received from the NOS:

- High altitude airways - the high altitude or jet airways for the US. Each airway is described by the airway number followed by the fixes composing the airway. Fixes are of several types: NAVAIDs; reporting points (adapted fixes); ARTCC boundary crossings; airway intersections; and waypoints (unnamed fixes). Each fix is specified by a latitude and longitude pair, the type of fix, and the facility name, where appropriate.
- Low altitude airways - the low altitude or Victor airways for the US. The file format is the same as for the high altitude airways.
- Alaskan high altitude airways - the high altitude or Jet airways for Alaska. The file format is the same as for the high altitude airways.
- Alaskan low altitude airways - the low altitude or Victor airways for Alaska. The file format is the same as for the high altitude airways.
- Bahamian airways - the airways for the Bahamas. The file format is the same as for the high altitude airways.

- Hawaiian low altitude airways - the low altitude or Victor airways for Hawaii. The file format is the same as for the high altitude airways.
- Oceanic airways - selected off-shore airways. The data includes jet airways, color-coded airways, and airways that are simply numbered. The file format is the same as for the high altitude airways.
- Puerto Rican airways - the airways for Puerto Rico. The file format is the same as for the continental high altitude airways.
- DPs - the Departure Procedures, formerly known as Standard Instrument Departure routes (SIDs). Each DP is preceded by its full name followed by a name in parentheses, which is the DP name and fix name as they would appear in a flight plan (e.g., ALCOS2.ALCOS). Lines following the name specify the route of the root (first) segment of the DP in the same format as the other route files. Any transitions (possible choices for a second, continuing segment) for the DP follow the root segment. Again, each transition is preceded by the full name optionally followed by the DP name and transition fix name, in parentheses, as they would appear in a flight plan (e.g., ALCOS2.CKW). Lines following the transition title specify the route of the transition in the usual route format. A variable number of transitions are associated with a DP. Generally, the root segment ends at the fix, which is the start of the transition.

  NOTE: The DP definitions do not include altitude or speed profile data.

- STARs - the Standard Terminal Arrival Routes. The file format is the same as for the DPs except that the direction is reversed; i.e., the transition ends at the fix, which is the start of the root segment.

  NOTE: The STAR definitions do not include altitude or speed profile data.

- Military training routes – military training routes are identified by names such as IR2 or IR11. The format is similar to high altitude airways, except all points are fix-radial-distances and include altitude information.

4.6.1.17.4 Geographical Data from NAV CANADA and Canadian ETMS sites

The following data is received from NAV CANADA:

- Fixes - reporting points in Canada, including aliases and holding fixes
- Landing facilities - airports in Canada
- Airways - Canadian airways
- STARS - the Standard Terminal Arrival Routes
- Restricted Areas - the boundaries for restricted areas.

The following data is received from the Canadian ETMS sites:

- Airspaces - sector definitions within the jurisdiction of each site.

4.6.2 TFM Internal Interfaces

As shown in Exhibit 4-5. TFM/ETMS Interface Context Diagram and Section 4.6.1, ETMS External Interfaces, the ETMS Hubsite and the remote TMU sites receive a variety of information about flight operations from external sources. If this data is received at a TMU site, it is sent to the ETMS Hubsite. The ETMS Hubsite integrates all inputs to perform its traffic demand, alert, and traffic management processing. The results are stored in operational databases at the Hubsite and are distributed to file servers and workstations at the remote sites. At the remote sites, the information is displayed and/or manipulated on the TSD (or WSD) and FSM workstations. Additionally, the TSD Reroute functions at the remote sites access the RMT and Playbook databases that reside at the ATCSCC.

The information exchange among the ETMS Hubsite, the ATCSCC, and the remote TMU sites comprises the set of TFM internal interfaces. This section describes those interfaces.

The following list describes the three categories of TFM internal interfaces. Only the first category is elaborated further within this section.

- ETMS Hubsite to ETMS TMU – These interfaces are internal to ETMS and are necessitated by the distributed nature of ETMS. They include the exchange of information between the ETMS Hubsite and the remote sites. They also include the interface that allows each ETMS site, including the Hubsite, to access the RMT and Playbook databases at the ATCSCC. Note that ETMS includes many diverse components including the TSD/WSD and FSM. These interfaces are required to support daily traffic management operations.

  In contrast to the ETMS external interfaces (see Section 4.6.1) whose processing criticality is categorized as NAS 'Essential', the processing of these interfaces is categorized as NAS 'Mission Critical'.

- Intra-site operational interfaces – These interfaces are between ETMS and other traffic management tools supporting daily operations that are co-located within the same facility. The other tools include Real Time FSA and Near-Real Time POET. Near-Real Time POET populates its database with data from ETMS via FTM Connect, an ETMS function that uses standard TCP/IP protocols. Real Time FSA (RT FSA) reads data directly from the co-located FSM server files.
- Internal post-analysis interfaces – These interfaces are required to support post-analysis of traffic management data. The interfaces are between archived ETMS data and the post analysis tools (i.e., Post Analysis FSA and POET). The Post Analysis FSA tool reads the FSM server files and POET obtains data from the 'rolling' 45-day ETMS archive database residing on servers at the ATCSCC and Metron Aviation.

4.6.2.1 ETMS Hubsite to ETMS TMU

This interface enables bi-directional exchange of dynamic real-time and non-real-time data between the ETMS Hubsite and the TMUs collocated within the field sites, including the ATCSCC. It also allows each ETMS site, including the Hubsite, to access the RMT and Playbook databases at the ATCSCC. The physical connections are made through a routed WAN. Section 13.4, ETMS Communications Functions, of the *ETMS Functional Description, Version 7.4*, provides a detailed description of the ETMS communications software that allows any process at any ETMS site to communicate with any other process at any ETMS site.

Exhibit 4-20. ETMS Hubsite-to-TMU Message Summary Table summarizes the messages exchanged across the ETMS Hubsite-to-TMU interface. The flow of messages between the ETMS Hubsite and the TMUs is bi-directional. Section 5.4.1.1.1.3, ETMS Internal Data Distribution, describes how ETMS data is distributed between the Hubsite and the remote sites in more detail.

The ETMS Hubsite also has a browser-based interface with FAA facilities, non-FAA U.S. government facilities, and the airlines to support the WSD and CCSD. The FAA and non-FAA U.S. government facilities use the WSD as an inexpensive TSD alternative and the airlines use the CCSD for the same purpose. The CCSD is available only from the Intranet, either the ATCSCC Intranet or CDMNet. The WSD is available from either the Internet or the ATCSCC Intranet. Although the CCSD uses a subset of the information provided to WSD, the interfaces for the WSD and CCSD are identical.

The Hubsite provides the following information to the WSD / CCSD users:

- WSI weather data
- CCFP data
- Flight data
- Alert data.

See Section 6.1.2, Common Constraint Situation Display, for a summary of the differences between CCSD and the WSD.

Exhibit 4-20. ETMS Hubsite-to-TMU Message Summary Table

Message Description	Message Type	Direction
Estimated Departure Clearance Time (EDCT)	CT	ETMS Hubsite to TMU; TMU to ETMS Hubsite
Fuel Advisory (FAD Flow)	FA	TMU to ETMS Hubsite
General and Advisory		TMU to ETMS Hubsite
Flight Data		TMU to ETMS Hubsite
Aircraft Data		ETMS Hubsite to TMU
Alert Data		ETMS Hubsite to TMU
List Data		ETMS Hubsite to TMU
Weather Data		ETMS Hubsite to TMU
Weather Requests and Status		TMU to ETMS Hubsite
TAF/METAR Weather Reports		ETMS Hubsite to TMU
Schedule Data		ETMS Hubsite to TMU; TMU to ETMS Hubsite
Demand Data		ETMS Hubsite to TMU; TMU to ETMS Hubsite
Geographical Data		ETMS Hubsite to TMU
Reroute Data		ETMS Hubsite to TMU; TMU to ETMS Hubsite; TMU to TMU (where one of the TMUs is the ATCSCC)
NAS Messages		TMU to ETMS Hubsite

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